

Update for RSAC on NAJPTC Project

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July 8, 2003

Agenda

- **Status Summary**
 - Alan Polivka (TTCI)
- **SDI Status**
 - Craig Shier (LM)
- **Test Status**
 - Bill Moore Ede (CANAC)
- **Roadway Worker Protection**
 - Howard Moody (AAR) & Bill Moore Ede
- **EIC Project**
 - Alan Polivka

Summary of PTC Project Status

Build 1 – Complete & Successfully Tested (Oct '02) ✓

Build 2 - High Speed Train Control Development Underway

- Closed Action Items from Build 2 CDR ✓
- Build 2 Design CDRLs (~10,000 pp) all Delivered & Reviewed ✓
- I/O between PTC & UPRR CAD Integrated ✓
- Wayside Equipment Installed ✓
- Wayside Cutover Delayed but Now Underway
- Onboard Brake Interface Re-design Underway
- Field Data Gathering and Initial Checkout begun
- Build 2 to be Complete around End of 2003

Summary of PTC Project Status (cont.)

Responses Received & Evaluated to 3rd Party Assessment RFI ✓

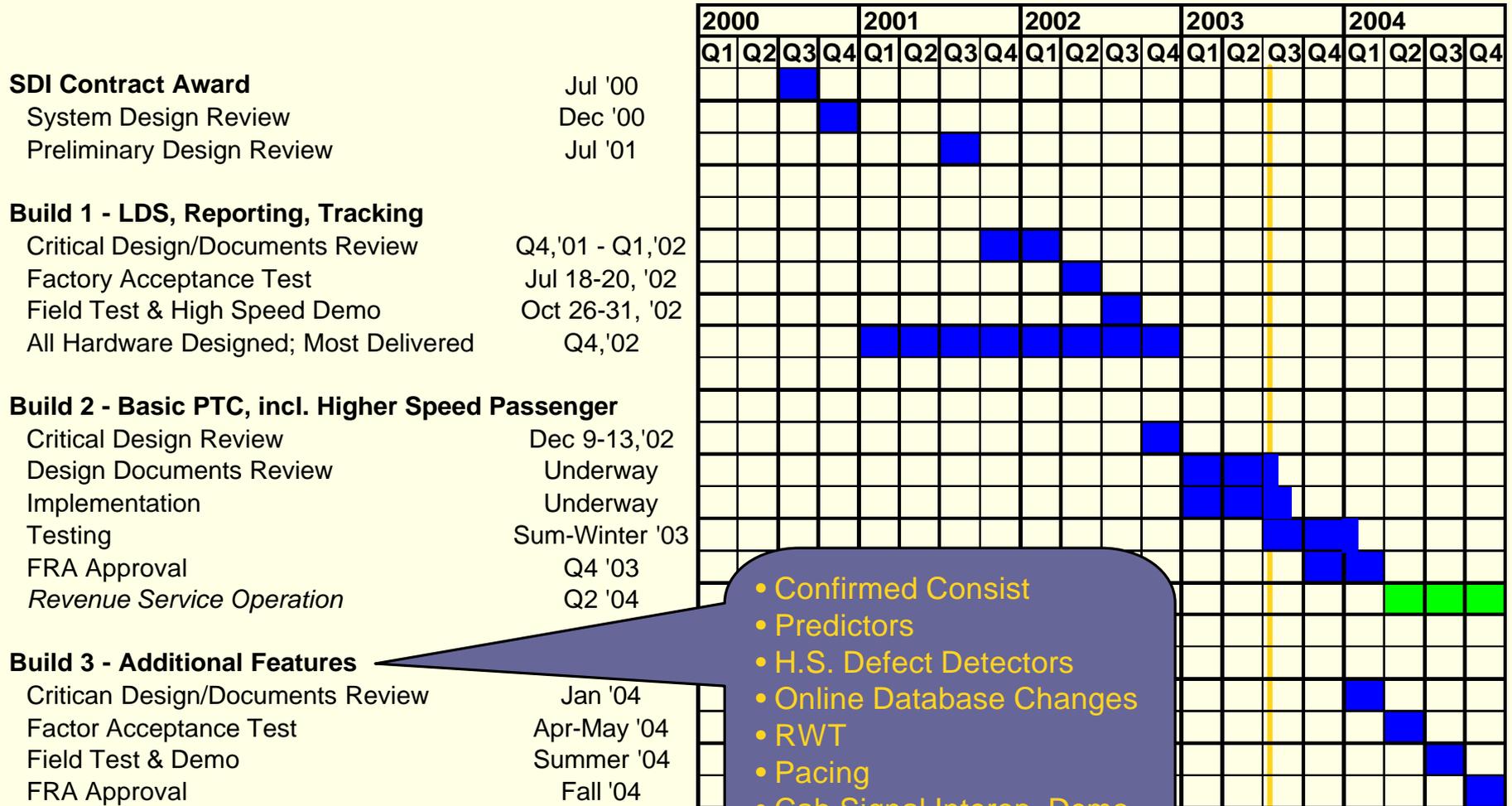
2003 Funding Delayed

Build 3 – Will add more Features in 2004

Letters from FRA, BRS, & BMWWE re Roadway Worker Protection

- Forwarding to NAJPTC Management Committee
- Will describe PTC Roadway Worker Functionality Today

Schedule and Builds



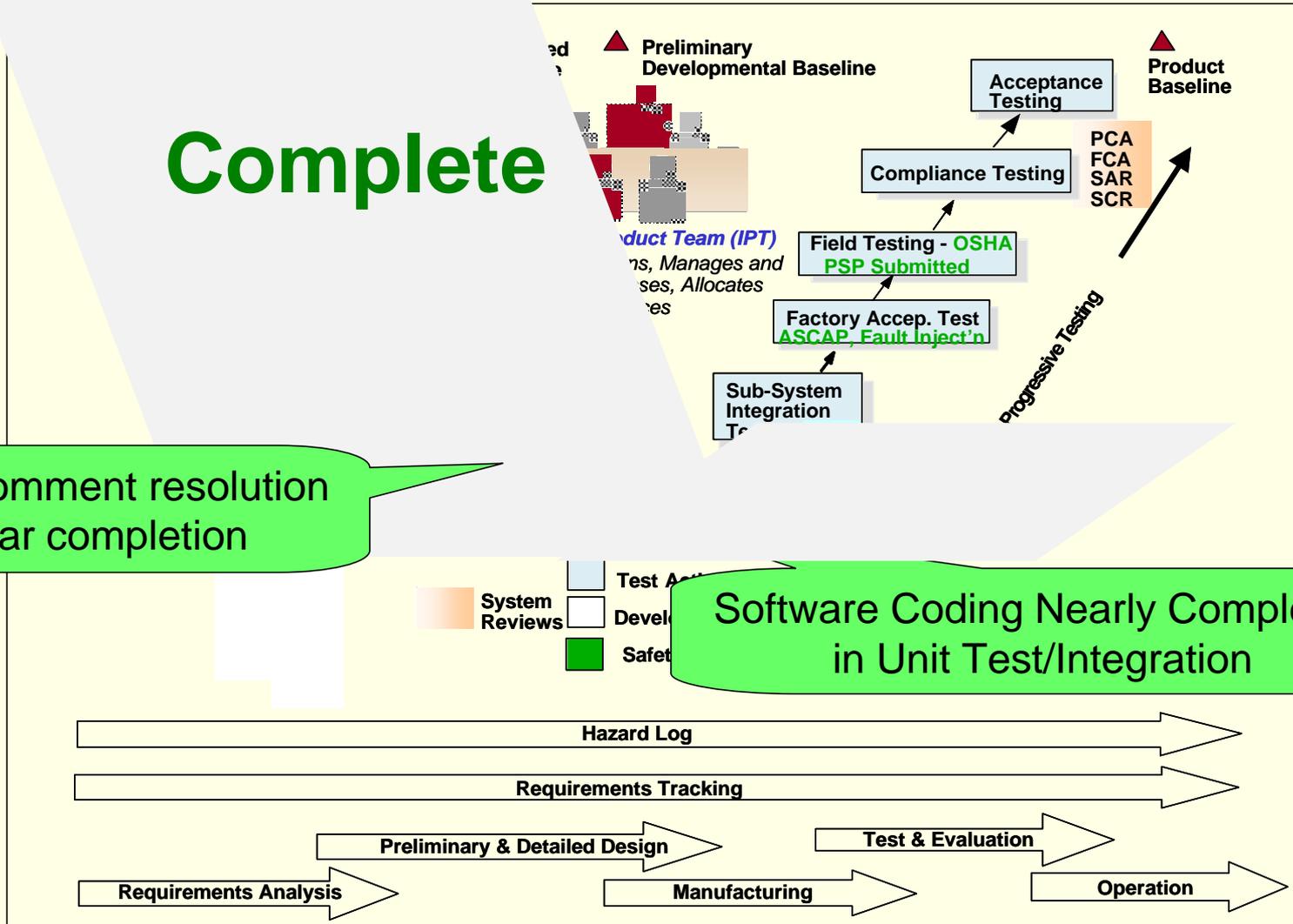
- Confirmed Consist
- Predictors
- H.S. Defect Detectors
- Online Database Changes
- RWT
- Pacing
- Cab Signal Interop. Demo
- Functional Negotiation

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Build 2 Schedule

Complete



PTC Safety Program Status

- **Major Milestones Recently Completed**
 - June Field Trials to verify track database and LDS updates
 - June 26 Brake Multiple-Interface Brake Enforcement Module (MBEM) Preliminary Design Review
 - Fault Tree Analysis revision nearly complete
 - Most Design Document comments resolved
- **Production Status**
 - Locomotive Segment PTC equipment production complete.
 - 10 locomotives have been cabled.

Status of IDOT PTC Safety Program Deliverables

- **FFT – Accepted by PO, sent to FRA.**
- **PHA – Accepted by PO, sent to FRA.**
- **Safety Requirements Doc – Accepted by PO, sent to FRA.**
- **Part 236 A-G Applicability Matrix – Accepted by PO, sent to FRA.**
- **Safety Assurance Concepts – Delivered March 12, new comments resolved**
- **Fault Trees – Initial Delivery March 7, Comments received/resolved, Update nearly complete, in informal review**
- **SSHA(s) – Initial Delivery April 9, Comments Received**
- **PSP Outline/Container – clarified final comments**
- **ASCAP Base Case – Update software for peer reviews, “long” runs with projected traffic.**
- **Near Term Goals**
 - Final Safety Analysis of Detailed Design (FHA, FMEA)
 - Comment Resolution for remaining Design Documents

ASCAP/UVA Base Case Status

- **Completed comment resolution on ASCAP inputs document**
- **April 8 discussion with FRA on Structure of Model Output**
- **July 1 discussion with UPRR on details of equipment, Form B, T&T, signal configurations.**
- **Model structure is now complete**
- **Key elements remaining to complete:**
 - Update equipment failure parameters
 - Re-publish documentation baseline
 - Software final debug
 - Evaluate/Review Incident/Accident Simulation Output
 - Review equipment and passenger cost models

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Types of Testing

- **Factory**
 - Unit
 - Component
 - Subsystem
 - System Integration
 - Factory Acceptance Tests
- **Field**
 - Field Trials
 - Dry Run of Formal Field Tests
 - Formal Field Tests

Build 1 Field Tests – Location Tracking

- **Performed on ~30 miles of route in October 2002**
- **Demonstrated that Location Determination System (LDS) can track train to within 10 feet**
- **Demonstrated that LDS could track trains through Turnouts**
 - **Operating through #20 turnouts at ~2 mph, LDS determined route within ~60 feet (1-1/2 – 2 feet lateral displacement)**
- **100% correct turnout decisions made**

Types of Field Testing

- **Field Trials**
 - Objectives: Informal system check-out of functions under field conditions – uncover faults not revealed by lab conditions
 - Fact finding & data gathering
- **Dry Run of Formal Tests**
 - Objectives: Dry run formal test procedures to ensure that procedures are correct and that operating procedures are workable
- **Formal Tests**
 - Observed by designated observers to verify that system requirements are met under various operating conditions

Build 2 Field Trials – June 2003

- **Objectives**

- To determine if the database created from the FliMap had been translated correctly – would LDS work with it
- To determine that the system would work within freight locomotive environment
- To check out whether the switches to various auxiliary tracks had been mapped correctly
- To capture LDS data for track that needs to be mapped beyond the range of the FliMap data

Results of June Field Trials

- **Operated over entire territory three times (Mazonia – Ridgely North ~120 miles)**
 - Successfully operated on Main Track and through sidings
 - Database created from FliMap data, with track changes incorporated from engineering plans
 - Corrected errors with mapping of three switches overnight
 - Accurate auxiliary track data beyond range of FliMap collected with freight locomotive
- **Field Trials met objectives**

Upcoming Field Trials & Tests

- **August Field Trials**

- Objectives

- To gather data on system performance in the field environment, particularly as it relates to

- Issuance of authorities
- Following moves
- Advance activation of crossing warning devices
- Application and removal of Temporary Speed Restrictions

- **Build 2 Dry Run Tests and Formal Tests**

- Later in the Fall – dates TBD
- Objectives: to ensure that system performs as specified under a wide variety of operating conditions

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IDOT Project Objective

- **Objective is to design, develop and implement a revenue ready PTC system that will:**
 - Be installed on a corridor with both freight and high-speed passenger service
 - Meet the PTC RSAC safety objectives
 - Provide for industry interoperability
 - Be cost-effective

PTC Objectives

- **Safety**
 - Prevent train-to-train Collisions
 - Enforce Speed Limits
 - Protect Roadway Workers working within authorized limits
 - System will not result in a risk that exceeds the previous condition
- **Operational**
 - Allow all operations permitted by operating rule today
 - Do not add operating burden to those using the system

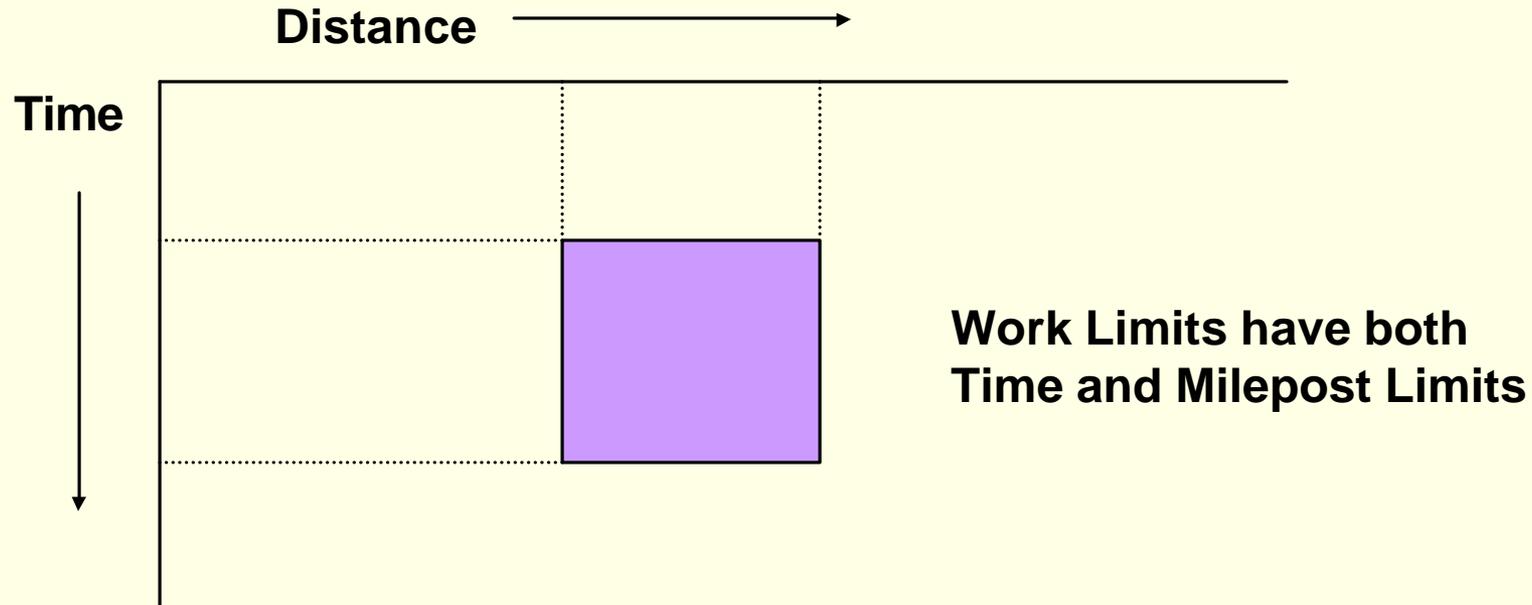
Types of MoW Track Access under GCOR

- **Track and Time**
 - May be joint
- **Working within Form B Work Limits**

Joint Track & Time

- **CTC**
 - Issued by Voice
 - Restricted Speed required by Rule
 - Dispatcher includes previous holders on subsequent holder's authority but generally not vice versa
 - However, subsequent holders must contact previous holders before entering limits
- **PTC**
 - Issued by Voice and Data
 - Restricted Speed required by Rule
 - Restricted Speed continuously displayed (first stimulus)
 - 20 mph maximum Speed enforced
 - Identity of all other holders displayed (second stimulus)

Form B Work Limits

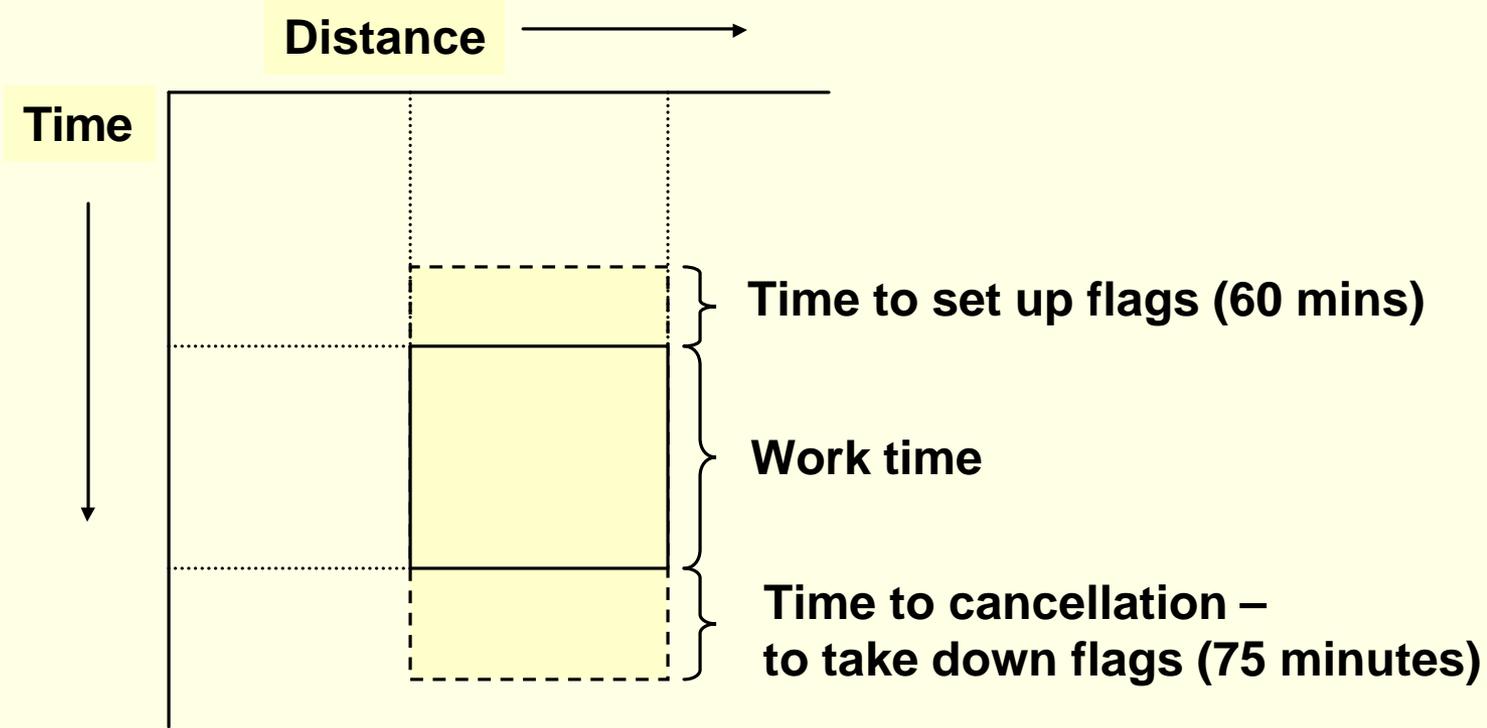


- **Stop Required**
 - Stop required before limits if no contact with EIC
 - Otherwise, proceed in accordance with EIC instructions
- **Stop not Required**
 - OK to proceed at Restricted Speed through limits if no contact with EIC; Otherwise, proceed in accordance with EIC instructions

Operating through Work Limits in CTC

- **Train crew picks up Bulletins at initial terminal**
 - Form As and Form Bs in separate bulletins, both in sequential order
- **Train crew contacts EIC, before reaching limits if possible**
- **Potential EIC responses**
 - Permits train through without restriction
 - Permits train through with restriction
 - Permits train to a point within limits
 - Tells train to wait at limits until further notice
 - If no response
 - Stop at limits, if stop required, until contact made
 - Otherwise, operate through limits at Restricted Speed

Elements of Form B Work Limits



Operating through Work Limits in PTC

- **Train crew picks up Bulletins at initial terminal**
 - Form As and Form Bs in separate bulletins, both in sequential order
- **Bulletins displayed in text and in graphics on locomotive display**
 - Display is designed as safety-critical
 - Bulletins displayed in milepost sequence, Form As & Bs in sequence
 - First stimulus – Form B displayed when limit is within display horizon
 - 6-8 miles

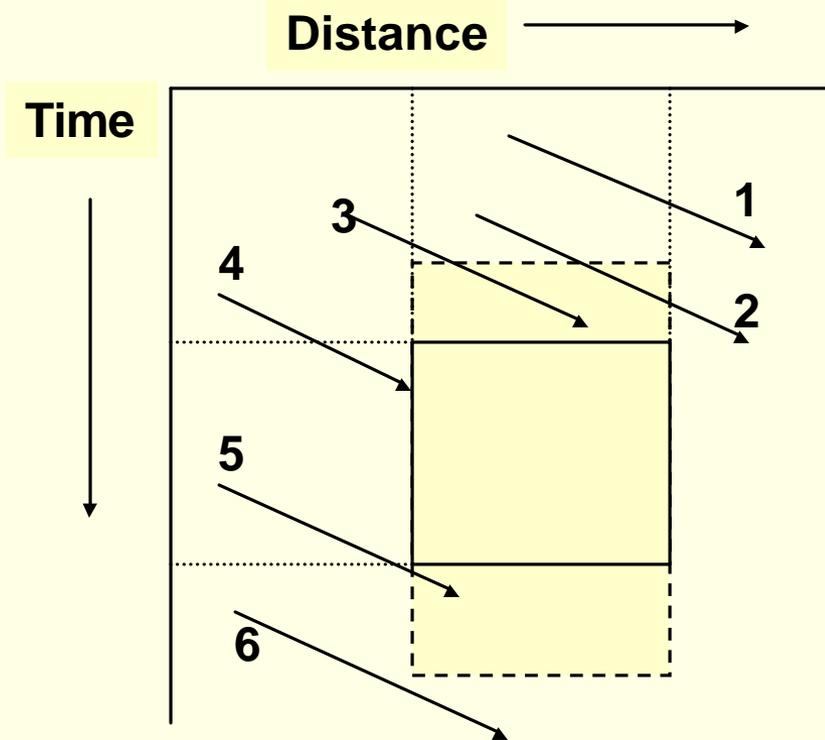
Operating through Work Limits in PTC - 2

- **Train crew contacts EIC, before reaching limits if possible**
- **Second Stimulus – Form B Warning**
 - At a distance of braking distance plus 40 seconds warning time, warning of approach to limits displayed
 - Count-down started
 - Acknowledgement required
- **When acknowledged**
 - Text display remains
 - Graphical display changes color – third stimulus

Operating through Work Limits in PTC - 3

- **Train crew responsible for obeying EIC instructions as in today's operations (operating rules)**
- **If operating through milepost limits before effective time, limits and start time are displayed**
- **If operating through milepost limits after expiry time but before cancelled, limits are displayed, but no acknowledgement required**

Scenarios



- 1. Not Displayed**
- 2. Displayed but no prompt for Ack**
- 3. Displayed and enforced if no Ack**
- 4. Displayed and enforced if no Ack**
- 5. Displayed but no prompt for Ack**
- 6. Not Displayed**

Form B Operational Failures Addressed

	<u>Addressed</u>
● Crew misjudges distance to Limit – fails to stop short	2
● Crew fails (forgets) to contact EIC	2
● Crew leaves terminal with incomplete set of bulletins	2
● Incorrectly placed flags (bad stimulus)	2
● Work Limits incorrect (miscommunication EIC-dispatcher) (3)	

Conclusions

- **NAJPTC not relaxing any current safety mechanisms or rules**
- **PTC will provide additional Roadway Worker protection (whether or not they have an RWT) in the following ways**
 - Enforcement of authority limits prevents violation of Track and Time
 - Enforcement of 20 mph in joint Track & Time
 - Timely display of Form B restrictions in locomotives
 - Constant reminder of presence of roadway workers
 - Form B
 - Joint Track & Time
- **Forms foundation for future enhancements**

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EIC Project

- **New FRA-sponsored project will develop Portable Terminal for Employee In Charge (EIC)**
 - under AAR Cooperative Agreement with FRA (not NAJPTC)
 - TTCl is Managing the Project
- **Primary Objective in 2003 is to develop User Requirements**
- **Anticipate Development to Begin in 2004**
- **Anyone having specific recommendations for EIC Portable Terminal functionality should provide them in a prioritized list to Alan Polivka by July 31, 2003.**
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 - fax: 719-584-0672
 - alan_polivka@aar.com